IBM NeXtScale nx360 M5

IBM Redbooks Product Guide

IBM® NeXtScale System™ is the next generation of dense computing. It is an open, flexible, and simple data center solution for users of technical computing, grid deployments, analytics workloads, and large-scale cloud and virtualization infrastructures. The IBM NeXtScale n1200 enclosure and new IBM NeXtScale nx360 M5 server are designed to optimize density and performance within typical data center infrastructure limits. The 6U NeXtScale n1200 enclosure fits in a standard 19-inch rack and up to 12 nx360 M5 servers can be installed into the enclosure. With more computing power per watt and the latest Intel Xeon v3 processors, you can reduce costs while maintaining speed and availability.

Suggested use: HPC, technical computing, grid deployments, analytics workloads, and large-scale cloud, managed service providers, and virtualization infrastructures

The following figure shows the IBM NeXtScale nx360 M5 server.

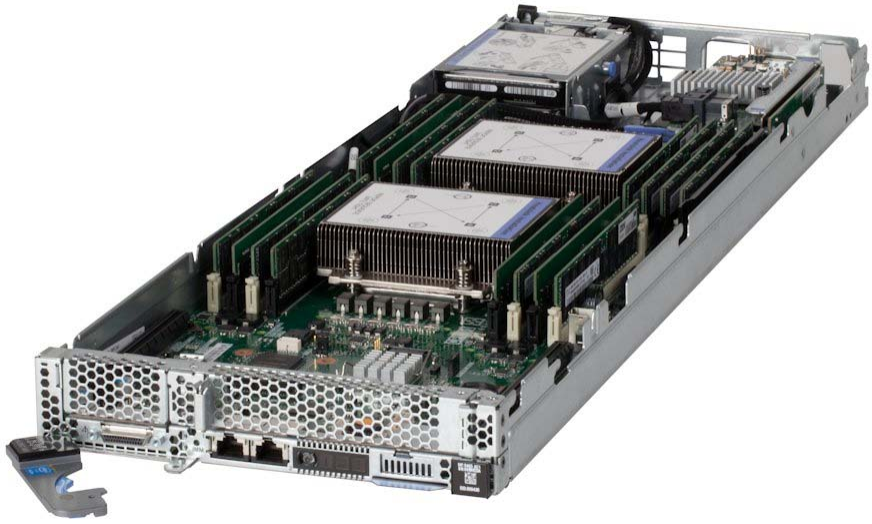

Figure 1. The IBM NeXtScale nx360 M5 server is based on the Intel Xeon E5-2600 v3 processor family

Did you know?

IBM NeXtScale System is built with industry-standard components to create flexible configurations of servers, chassis, and networking switches that integrate easily in a standard 19-inch rack. It is a general-purpose platform that provides flexibility to clients for creating unique and differentiated solutions using off-the-shelf components. Front-access cabling enables you to quickly and easily make changes in networking, power connections, and storage. The nx360 M5 and n1200 enclosure are also available in direct-water cooled configurations for the ultimate in data center cooling efficiencies.

Key features

IBM NeXtScale System M5 is the next generation dense platform from IBM System x®, following on from the NeXtScale System M4 offering and its predecessor, IBM iDataPlex®. The NeXtScale system includes a dense chassis, half wide compute nodes, plus storage and GPU nodes, all fitting within a standard rack footprint. With M5, IBM extends the feature set to drive further growth in High Performance Computing and also to reach even more segments and workloads requiring dense performance, such as Cloud, Grid, and Analytics.

Designed with industry-standard, off-the-shelf components, IBM NeXtScale System is a general-purpose platform that is designed to give customers a flexible IT infrastructure. The offering includes compute-intensive systems, and GPU offerings and storage offerings. Customized solutions can be configured to provide an application-appropriate platform with a choice of servers, networking switches, adapters, and racks.

This modular system is designed to scale and grow with data center needs to protect and maximize IT investments. Because it is optimized for standard racks, users can easily mix high-density NeXtScale server offerings and non-NeXtScale components within the same rack. IBM NeXtScale System also provides tremendous time to value by enabling users to set up and start it in a shorter period.

The NeXtScale nx360 M5 server provides a dense, flexible solution with a low total cost of ownership (TCO). The half-wide, dual-socket NeXtScale nx360 M5 server is designed for data centers that require high performance but are constrained by floor space. By taking up less physical space in the data center, the NeXtScale server enhances density, and it supports the Intel Xeon processor E5-2600 v3 series up to 145 W and 18-core processors, thus providing more performance per server. The nx360 M5 compute node contains only essential components in the base architecture to provide a cost-optimized platform.

The nx360 M5 also supports additional expansion options in the form of trays that attach to the top of the server. The PCIe Native Expansion Tray can be added to the nx360 M5 to form a powerful compute engine, supporting two GPU or coprocessor adapters. Planned for support is the Storage Native Expansion Tray, which can be added to the nx360 M5 to form a storage-dense server supporting up to 48 TB of local SAS-attached storage.

The NeXtScale n1200 Enclosure is an efficient, 6U, 12-node chassis with no built-in networking or switching capabilities, and therefore requires no chassis-level management. Sensibly designed to provide shared, high-efficiency power and cooling for housed servers, the n1200 enclosure is designed to scale with your business needs.

The NeXtScale nx360 M5 is also available as a warm-water-cooled server for the ultimate in energy efficiency, cooling, nois,e and TCO.

Scalability and performance

The IBM NeXtScale System and the NeXtScale nx360 M5 server offer numerous features to boost performance, improve scalability, and reduce costs:

- Up to 12 compute nodes, each with two of the latest Xeon processors, 16 DIMMs, and three PCIe slots, in 6U of rack space. It is a highly dense, scalable, and price-optimized offering.
- The Intel Xeon processor E5-2600 v3 product family improves productivity by offering superior system performance with 18-core processors, core speeds up to 3.2 GHz, L3 cache sizes up to 45 MB, DDR4 memory speeds up to 2133 MHz, and QPI interconnect links of up to 8 GTps.
- Two processors, up to 36 cores, and 72 threads maximize the concurrent execution of multi-threaded applications.

- Intelligent and adaptive system performance with Intel Turbo Boost Technology 2.0 allows CPU cores to run at maximum speeds during peak workloads by temporarily going beyond processor thermal design power (TDP).
- Intel Hyper-Threading Technology boosts performance for multi-threaded applications by enabling simultaneous multi-threading within each processor core, up to two threads per core.
- Intel Virtualization Technology integrates hardware-level virtualization hooks that allow operating system vendors to better use the hardware for virtualization workloads.
- Intel Advanced Vector Extensions (AVX) improve floating-point performance for compute-intensive technical and scientific applications.
- Sixteen DIMMs of registered 2133 MHz DDR4 ECC memory provide speed, high availability, and a memory capacity of up to 512 GB.
- Supports drives up to 6 TB capacity in the 3.5-inch form factor.
- Support for internal simple-swap drives, either one 3.5-inch drive, two 2.5-inch drives, or four 1.8-inch drives. Plus, in place of a PCIe slot, add two 2.5-inch hot-swap drives.
- Boosts performance with PCIe Native Expansion Tray by offering support for two high-powered GPUs or Intel Xeon Phi coprocessors within a single node.
- The use of solid-state drives (SSDs) instead of or with traditional hard disk drives (HDDs) can improve I/O performance. An SSD can support up to 100 times more I/O operations per second (IOPS) than a typical HDD.
- Three PCIe slots internal to the nx360 M4: Full-height PCIe slot, mezzanine LOM Generation 2 (ML2) slot, and dedicated internal RAID adapter slot.
- Supports new mezzanine LOM Generation 2 (ML2) cards for 40 Gb Ethernet and FDR InfiniBand that offer network performance in the smallest footprint.
- PCI Express 3.0 I/O expansion capabilities improve the theoretical maximum bandwidth by 60% (8 GTps per link) compared with the previous generation of PCI Express 2.0.
- With Intel Integrated I/O Technology, the PCI Express 3.0 controller is integrated into the Intel Xeon processor E5 family, which reduces I/O latency and increases overall system performance.

Manageability and security

Powerful systems management features simplify local and remote management of the nx360 M5:

- The server includes an Integrated Management Module II (IMM2) to monitor server availability and perform remote management.
- There is a standard Ethernet port that can be shared between the operating system and IMM2 for remote management with optional Features on Demand upgrade. There is an optional additional Ethernet port for dedicated IMM2 connectivity.
- An integrated industry-standard Unified Extensible Firmware Interface (UEFI) enables improved setup, configuration, and updates, and simplifies error handling.
- Integrated Trusted Platform Module (TPM) 1.2 support enables advanced cryptographic functions, such as digital signatures and remote attestation.
- Intel Trusted Execution Technology provides enhanced security through hardware-based resistance to malicious software attacks, allowing the application to run in its own isolated space that is protected from all other software running on a system.
- The Intel Execute Disable Bit function can prevent certain classes of malicious buffer overflow attacks when combined with a supporting operating system.

Energy efficiency

IBM NeXtScale System offers the following energy efficiency features to save energy, reduce operational costs, increase energy availability, and contribute to a green environment:

- Support for S3 standby power states in the processor.
- Shared 80 Plus Platinum power supplies ensure energy efficiency.
- Large 80 mm fans maximize air flow efficiencies.
- The Intel Xeon processor E5-2600 v3 product family offers better performance over the previous generation while fitting into the same TDP limits.
- Intel Intelligent Power Capability powers on and off individual processor elements as needed to reduce power draw.
- Low-voltage Intel Xeon processors draw less energy to satisfy the demands of power and thermally constrained data centers and telecommunication environments.
- Low-voltage 1.2 V DDR4 memory DIMMs consume up to 20% less energy compared to 1.35 V DDR3 DIMMs.
- SSDs consume as much as 80% less power than traditional 2.5-inch HDDs.
- The server uses hexagonal ventilation holes in the front and rear of the casing, which can be grouped more densely than round holes, providing more efficient airflow through the system.
- There are power monitoring and power capping capabilities through the Power and Fan Management Module in the chassis

Availability and serviceability

IBM NeXtScale System and the nx360 M5 server provide many features to simplify serviceability and increase system uptime:

- The NeXtScale n1200 chassis supports N+N and N+1 power policies for its six power supplies, which means greater system uptime.
- All components can be removed from the front of the rack by sliding out the trays or the chassis for easy, quick servicing.
- Toolless cover removal provides easy access to upgrades and serviceable parts, such as HDDs and memory.
- Optional RAID arrays enable the server to keep operating if there is a failure of any one drive.
- SSDs offer better reliability than traditional mechanical HDDs for greater uptime.
- Predictive Failure Analysis (PFA) detects when system components (processors, memory, and hard disk drives) operate outside of standard thresholds and generates proactive alerts in advance of possible failure, therefore increasing uptime.
- The built-in Integrated Management Module II (IMM2) continuously monitors system parameters, triggers alerts, and performs recovering actions in case of failures to minimize downtime.
- The IMM2 offers optional remote management capability to enable remote keyboard, video, and mouse (KVM) control of the server.
- There is a three-year customer replaceable unit and onsite limited warranty, with next business day 9x5. Optional service upgrades are available.

Locations of key components and connectors

The following figure shows the front of the nx360 M5 server.

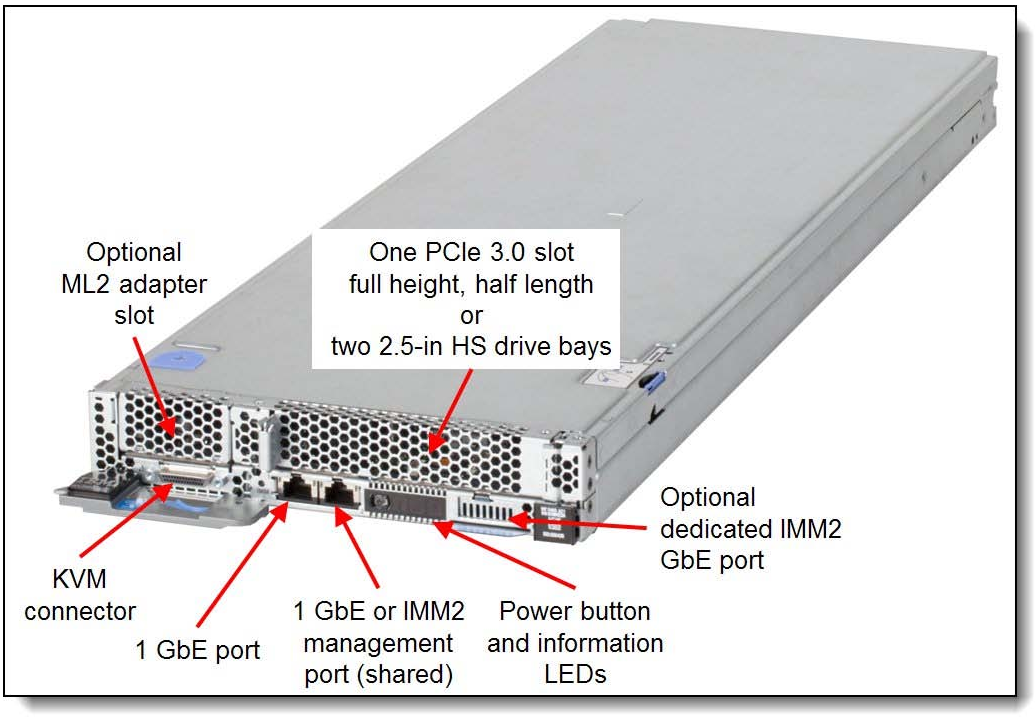

Figure 2. Front view of IBM NeXtScale nx360 M5

The following figure shows the locations of key components inside the server.

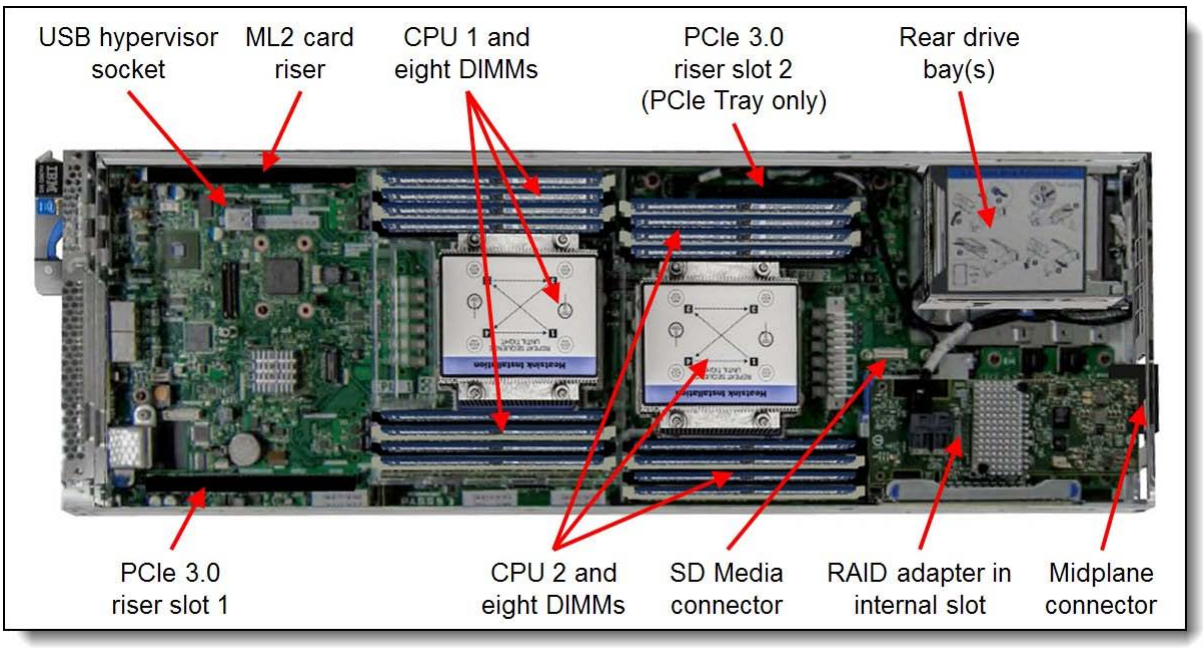

Figure 3. Inside view of the NeXtScale nx360 M5

The compute nodes are installed in the IBM NeXtScale n1200 enclosure, as shown in the following figure.

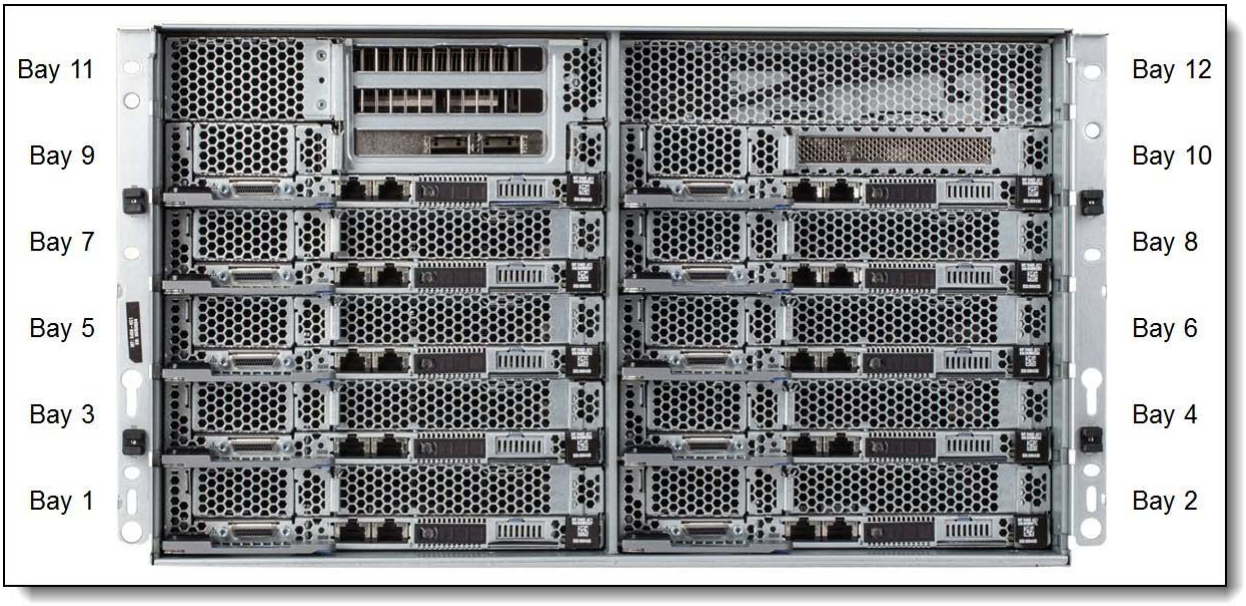

Figure 4. Front view of the IBM NeXtScale n1200 enclosure

The rear of the enclosure contains the power supplies, fans, and the Fan and Power Controller, as shown in the following figure.

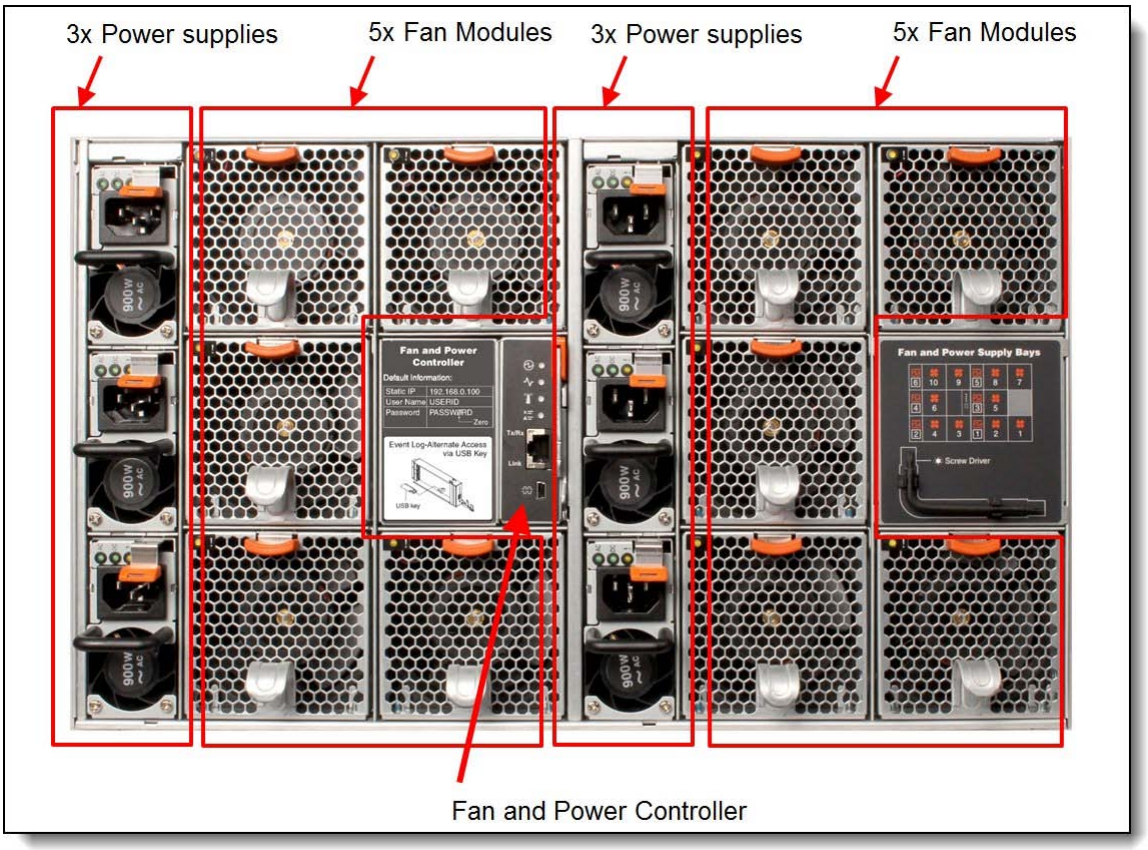

Figure 5. Rear view of the IBM NeXtScale n1200 enclosure

Standard specifications

The following table lists the standard specifications of the NeXtScale nx360 M5 compute node and NeXtScale n1200 enclosure.

Table 1. Standard specifications (part 1)

Components	Specification
Form factor	Standard server: Half-wide, 1U compute node. With optional NeXtScale PCIe Native Expansion Tray: Half-wide 2U compute node.
Supported chassis	IBM NeXtScale n1200 enclosure, 6U high; up to 12 compute nodes per chassis.
Processor	Two Intel Xeon Processor E5-2600 v3 series processors; QuickPath Interconnect (QPI) links speed up to 8.0 GTps. Hyper-Threading Technology and Turbo Boost Technology. Intel C612 chipset. ● 6-core processors 2.4 GHz and 15 MB L3 cache ● 8-core processors up to 3.2 GHz and 20 MB L3 cache ● 10-core processors up to 2.6 GHz and 25 MB L3 cache ● 12-core processors up to 2.6 GHz and 30 MB L3 cache ● 14-core processors up to 2.6 GHz and 35 MB L3 cache ● 16-core processors 2.3 GHz and 40 MB L3 cache ● 18-core processors 2.3 GHz and 45 MB L3 cache
Memory	Up to 16 DIMM sockets (8 DIMMs per processor) supporting DDR4 DIMMs up to 2133 MHz memory speeds. RDIMMs and LRDIMMs are supported. Four memory channels per processor (two DIMMs per channel).
Memory maximums	Up to 512 GB with 16x 32 GB LRDIMMs and two processors.
Memory protection	Chipkill (x4 memory options only), ECC.
Disk drive bays	*Internal to the nx360 M5* (not front accessible): One 3.5-inch simple-swap SATA or two 2.5-inch simple swap SAS/SATA HDDs or SSDs, or four 1.8-inch simple-swap SSDs. *Front-accessible bays*: Two 2.5-inch hot-swap drive bays (optional, replaces the full-height PCIe slot, only supported if internal drive bays are also 2.5-inch bays). NeXtScale Storage Native Expansion Tray currently is not supported.
Maximum internal storage	● Using 3.5-inch drives: 6.0 TB using 1x 6TB 3.5-inch drive (internal) ● Using 2.5-inch drives: 5.6 TB using 2x 1.2 TB HDDs (internal) + 2x 1.6 TB HS SSDs (front) ● Using 1.8-inch drives: 1.6 TB using 4x 400 GB SSDs (internal)
RAID support	Four 6 Gb SATA ports through onboard Intel C612 chipset. No RAID standard. Optional 12 Gb SAS/SATA RAID adapter installed in dedicated internal PCIe slot. Supports ServeRAID M5210 or M1215, both standard with RAID 0 and 1. Optional M5210 upgrades: RAID 5, 50 (zero-cache, or 1 GB non-backed cache, or 1 GB or 2 GB or 4 GB flash-backed cache), RAID 6, 60, FoD performance upgrades; Optional upgrade to M1215 for RAID 5 support (zero-cache). No support for ServeRAID C100 or C105 software RAID.
Optical drive bays	No internal bays. Use an external USB drive, such as the IBM and Lenovo part number 73P4515 or 73P4516.
Tape drive bays	No internal bays. Use an external USB drive.

Table 1. Standard specifications (part 2)

Components	Specification
Network interfaces	Integrated two-port Gigabit Ethernet (Broadcom BCM5717) with RJ45 connectors. One port dedicated for use by the operating system, and one configurable either as shared by the operating system and Integrated Management Module (IMM) or as dedicated to the IMM. Optional third GbE port for dedicated IMM2 access. Optionally, two InfiniBand ports or two 10 GbE ports through a Mezzanine LOM Gen 2 (ML2) adapter slot. ML2 adapters support shared access to the IMM.
PCI Expansion slots	nx360 M5 without PCIe Native Expansion Tray: ● One PCIe 3.0 x16 ML2 adapter slot ● One PCIe 3.0 x16 full-height half-length slot (or two 2.5-inch hot-swap drive bays) ● One PCIe 2.0 x8 slot for internal RAID controller nx360 M5 with PCIe Native Expansion Tray: ● One PCIe 3.0 x16 ML2 adapter slot ● One PCIe 3.0 x8 full-height half-length slot (or two 2.5-inch hot-swap drive bays) ● One PCIe 2.0 x8 slot for internal RAID controller ● Two PCIe 3.0 x16 full-height full-length double-width slots
Ports	*Front of the server*: KVM connector; with the addition of a console breakout cable (1 cable standard with the chassis) supplies one RS232 serial port, one VGA port, and two USB 1.1 ports for local console connectivity. Two 1 Gbps Ethernet ports with RJ45 connectors. Optional third GbE port for dedicated IMM2 access. *Internal*: One internal USB port for VMware ESXi hypervisor key. *Rear of the enclosure* (provided by the Fan and Power Controller for chassis management): Gb Ethernet connection (RJ45) for remote management
Cooling	Supplied by the NeXtScale n1200 enclosure. 10 hot-swap dual-rotor 80 mm system fans with tool-less design.
Power supply	Supplied by the NeXtScale n1200 enclosure. Up to six hot-swap power supplies either 900 W or 1300 W depending on the chassis model. Support power policies N+N or N+1 power redundancy. 80 PLUS Platinum certified.
Systems management	UEFI, IBM Integrated Management Module II (IMM2.1) with Renesas SH7758 controller, Predictive Failure Analysis, Light Path Diagnostics, Automatic Server Restart, and IBM ServerGuide. Browser-based chassis management through an Ethernet port on the Fan and Power Controller at the rear of the enclosure. IMM2 upgrades are available to IMM2 Standard and IMM2 Advanced for web GUI and remote presence features.
Video	Matrox G200eR2 video core with 16 MB DDR3 video memory that is integrated into the IMM2. Maximum resolution is 1600x1200 with 16M colors (32 bpp) at 75 Hz, or 1680x1050 with 16M colors at 60 Hz.
Security features	Power-on password, administrator's password, and Trusted Platform Module 1.2.
Operating systems supported	Microsoft Windows Server 2012 and 2012 R2, SUSE Linux Enterprise Server 11 and 12, Red Hat Enterprise Linux 6 and 6, VMware vSphere 5.1 and 5.5
Limited warranty	Three-year customer-replaceable unit and onsite limited warranty with 9x5/NBD.
Service and support	Optional service upgrades are available through IBM ServicePac®: 4-hour or 2-hour response time, 8-hour fix time, 1-year or 2-year warranty extension, remote technical support for IBM hardware and some IBM and OEM software.
Dimensions	nx360 M5 server: Width: 216 mm (8.5 in.), height: 41 mm (1.6 in.), depth: 659 mm (25.9 in.). n1200 enclosure: Width: 447 mm (17.6 in.), height: 263 mm (10.4 in.), depth: 915 mm (36 in.).
Weight	nx360 M5 maximum weight: 6.17 kg (13.6 lb). n1200 enclosure: Fully configured (stand-alone): 112 kg (247 lb), empty chassis 28 kg (62 lb).

The nx360 M5 servers are shipped with the following items:

- Statement of Limited Warranty
- Important Notices
- Documentation CD that contains the *Installation and Service Guide*

Standard models

The following table lists the standard models.

Table 2. Standard models

Model	Intel Xeon Processor† (2 maximum)	Memory and speed	RAID controller	Drive bays	Disks	Network	Optical
5465-22x	2x E5-2620 v3 6C 2.4GHz 15MB 1866MHz 85W	2x 8 GB 2133 MHz	6 Gbps SATA (No RAID)	1x 3.5-inch SS bay	Open	2x GbE	None
5465-42x	2x E5-2650 v3 10C 2.3GHz 25MB 2133MHz 105W	2x 8 GB 2133 MHz	6 Gbps SATA (No RAID)	1x 3.5-inch SS bay	Open	2x GbE	None
5465-62x	2x E5-2680 v3 12C 2.5GHz 30MB 2133MHz 120W	2x 16 GB 2133 MHz	6 Gbps SATA (No RAID)	2x 2.5-inch SS bays	Open	2x GbE	None

† Processor detail: Processor quantity and model, cores, core speed, L3 cache, memory speed, and power consumption.

For information about the standard features of the server, see the "Standard specifications" section.

NeXtScale n1200 Enclosure models

The NeXtScale nx360 M5 is supported in the IBM NeXtScale n1200 Enclosure. The standard n1200 Enclosure models are listed in the following table.

Table 3. Standard enclosure models

Model	Description	Fans (standard / max)	Power (standard / max)
5456-A2x	IBM NeXtScale n1200 Enclosure	10x 80mm / 10	6x 900 W / 6
5456-A3x	IBM NeXtScale n1200 Enclosure	10x 80mm / 10	2x 1300 W / 6
5456-A4x	IBM NeXtScale n1200 Enclosure	10x 80mm / 10	6x 1300 W / 6

The chassis ships with these items:

- Rail kit (88Y6763)
- Four detachable chassis lift handles
- One Console breakout cable (also known as a KVM Dongle)
- A Torx-8 (T8) screwdriver for use with components such as drive cages, mounted on the rear of the chassis
- One AC power cord for each power supply that is installed, 1.5m 10A, IEC320 C14 to C13 (part number 39Y7937)

The n1200 provides a shared high-efficiency power supply and fans. Like IBM BladeCenter® and IBM Flex System®, the NeXtScale System compute nodes connect to a midplane, but this connection is for power and control only; the midplane does not provide any I/O connectivity.

Processor options

The nx360 M5 supports the processor options that are listed in the following table.

Table 4. Processor options

Part number	Feature code*	Intel Xeon processors**	Where used
00FL163	A5HQ / A5J7	Intel Xeon Processor E5-2620 v3 6C 2.4GHz 15MB 1866MHz 85W	22x
00FL161	A5HN / A5J5	Intel Xeon Processor E5-2640 v3 8C 2.6GHz 20MB 1866MHz 90W	-
00FL159	A5HL / A5J3	Intel Xeon Processor E5-2650 v3 10C 2.3GHz 25MB 2133MHz 105W	42x
00FL160	A5HM / A5J4	Intel Xeon Processor E5-2650L v3 12C 1.8GHz 30MB 2133MHz 65W	-
00FL158	A5HK / A5J2	Intel Xeon Processor E5-2660 v3 10C 2.6GHz 25MB 2133MHz 105W	-
00FL167	A5HU / A5JB	Intel Xeon Processor E5-2667 v3 8C 3.2GHz 20MB 2133MHz 135W	-
00FL157	A5HJ / A5J1	Intel Xeon Processor E5-2670 v3 12C 2.3GHz 30MB 2133MHz 120W	-
00FL156	A5HH / A5J0	Intel Xeon Processor E5-2680 v3 12C 2.5GHz 30MB 2133MHz 120W	62x
00KA829	A5V0 / A5V1	Intel Xeon Processor E5-2683 v3 14C 2.0GHz 35MB 2133MHz 120W	-
00FL155	A5HG / A5HZ	Intel Xeon Processor E5-2690 v3 12C 2.6GHz 30MB 2133MHz 135W	-
00FL154	A5HF / A5HY	Intel Xeon Processor E5-2695 v3 14C 2.3GHz 35MB 2133MHz 120W	-
00FL153	A5HE / A5HX	Intel Xeon Processor E5-2697 v3 14C 2.6GHz 35MB 2133MHz 145W	-
00KA945	AS4L / AS4P	Intel Xeon Processor E5-2698 v3 16C 2.3GHz 40MB 2133MHz 135W	-
00KA947	AS4M / AS4Q	Intel Xeon Processor E5-2699 v3 18C 2.3GHz 45MB 2133MHz 145W	-

* The first feature code corresponds to the first processor; the second feature code corresponds to the second processor.
** Processor detail: Model, core count, core speed, L3 cache, memory speed, and TDP power.

Memory options

IBM TruDDR4 Memory uses the highest quality components that are sourced from Tier 1 DRAM suppliers and only memory that meets the strict requirements of IBM is selected. It is compatibility tested and tuned on every IBM System x server to maximize performance and reliability. IBM TruDDR4 Memory has a unique signature that is programmed into the DIMM that enables IBM System x servers to verify whether the memory installed is qualified/supported by IBM. Because IBM TruDDR4 Memory is authenticated, certain extended memory performance features can be enabled to extend performance over industry standards. From a service and support standpoint, IBM memory automatically assumes the IBM system warranty, and IBM provides service and support worldwide.

The NeXtScale nx360 M5 supports up to eight TruDDR Memory DIMMs when one processor is installed and up to 16x DIMMs when two processors are installed. Each processor has four memory channels, and there are two DIMMs per memory channel (2 DPC). RDIMMs and LRDIMMs are supported, but the mixing of these different types is not supported. UDIMMs are not supported.

The following table lists the memory options that are available for the nx360 M5 server.

Table 5. Memory options

Part number	Feature code	Description	Maximum supported	Models where used
RDIMMs				
46W0784	A5B6	4GB TruDDR4 Memory (1Rx8, 1.2V) PC4-17000 CL15 2133MHz LP RDIMM	16	-
46W0788	A5B5	8GB TruDDR4 Memory (1Rx4, 1.2V) PC4-17000 CL15 2133MHz LP RDIMM	16	-
46W0792	A5B8	8GB TruDDR4 Memory (2Rx8, 1.2V) PC4-17000 CL15 2133MHz LP RDIMM	16	22x, 42x
46W0796	A5B7	16GB TruDDR4 Memory (2Rx4, 1.2V) PC4-17000 CL15 2133MHz LP RDIMM	16	62x
LRDIMMs				
46W0800	A5B9	32GB TruDDR4 Memory (4Rx4, 1.2V) PC417000 CL15 2133MHz LP LRDIMM	16	-

In the nx360 M5, the maximum memory speed of a configuration is the lower of the following two values:

- The memory speed of the processor
- The memory speed of the DIMM

The following memory protection technologies are supported:

- ECC
- Chipkill (x4 memory options only: 1Rx4, 2Rx4, and 4Rx4)

The following table shows the maximum memory speeds that are achievable. The table also shows the maximum memory capacity at any speed that is supported by the DIMM and the maximum memory capacity at the rated DIMM speed.

Table 6. Maximum memory speeds

Spec	**RDIMMs**		**LRDIMMs**
Rank	Single rank	Dual rank	Quad rank
Part numbers	46W0784 (4GB) 46W0788 (8GB)	46W0792 (8GB) 46W0796 (16GB)	46W0800 (32GB)
Rated speed	2133 MHz	2133 MHz	2133 MHz
Rated voltage	1.2 V	1.2 V	1.2 V
Operating voltage	1.2 V	1.2 V	1.2 V
Max quantity*	16	16	16
Largest DIMM	8 GB	16 GB	32 GB
Max memory capacity	128 GB	256 GB	512 GB
Max memory at rated speed	64 GB	128 GB	512 GB
Maximum operating speed (MHz)			
1 DIMM per channel	2133 MHz	2133 MHz	2133 MHz
2 DIMMs per channel	2133 MHz	2133 MHz	2133 MHz

* The maximum quantity that is supported is shown for two installed processors. When one processor is installed, the maximum quantity that is supported is half of that shown.

Internal storage

The NeXtScale nx360 M5 server supports one of the following drives internally in the server:

- One 3.5-inch simple-swap SATA drive
- Two 2.5-inch simple-swap HDDs or SSDs
- Four 1.8-inch simple-swap SSDs

The following figure shows the three variations.

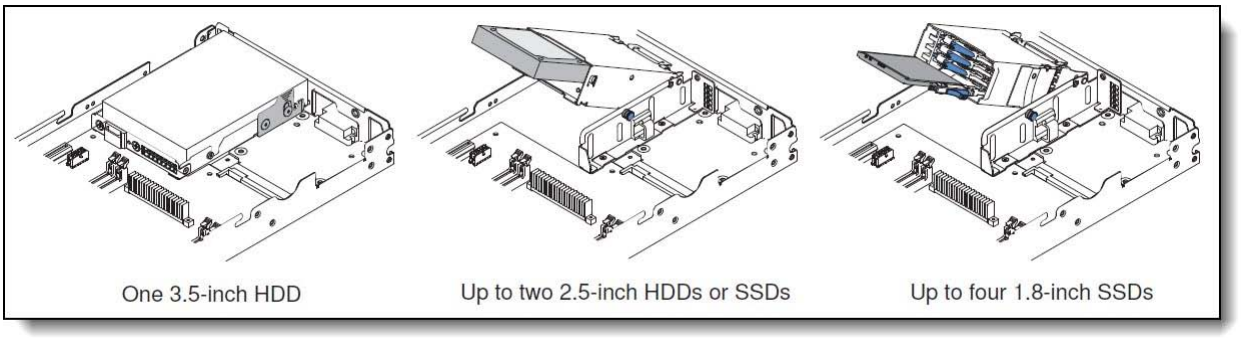

Figure 6. Drive bay options

These internal drives are installed in a drive cage. Ordering information for these drive cages are listed in the following table.

Table 8. Internal drive cages for the drive bay in the nx360 M5

Part number	Feature code	Description	Models where used
00KA895	A5V3	nx360 M5 1.8" Rear Drive Cage	-
00KA894	A5V2	nx360 M5 2.5" Rear Drive Cage	62x
00FL465	A5K1	nx360 M5 3.5" Rear Drive Cage	22x, 42x

In addition, if the internal drives are 2.5-inch drive bays, then the server also supports two additional 2.5-inch drive bays. These are front accessible and are hot-swap drive bays. These hot-swap drive bays take the place of the full-height PCIe slot, as shown in the following figure.

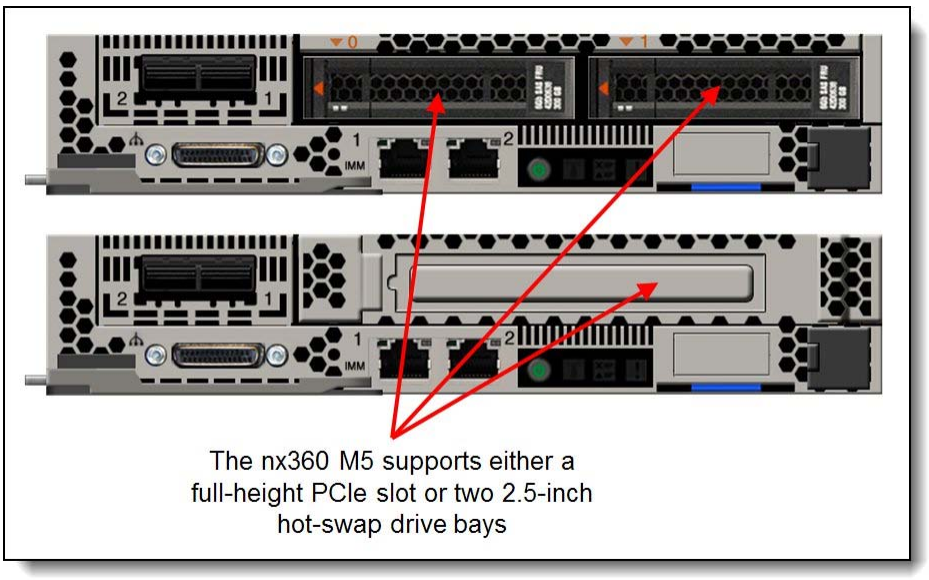

Figure 7. NeXtScale nx360 M5 configurations - hot-swap 2.5-inch drive bays or full-height PCIe slot

The following table shows the ordering information for the two 2.5-inch hot-swap drive bays.

Table 9. Drive cage for the hot-swap drive bay in the nx360 M5

Part number	Feature code	Description	Models where used
00FL175	A5NA	nx360 M5 2.5" Front Hot Swap Drive Cage	

Controllers for internal storage

The onboard SATA controller (integrated into the Intel C612 chipset) supports any of the following drive configurations:

- One 3.5-inch simple-swap SATA or NL SATA drive
- Two 2.5-inch simple-swap NL SATA drives
- Four 1.8-inch SATA Enterprise Value SSDs

The following drive combinations may be used instead with a RAID controller or SAS HBA that is installed in the internal RAID adapter riser slot:

- Two 2.5-inch simple-swap NL SATA drives
- Four 1.8-inch SATA Enterprise Value SSDs

Any of the following drive configurations *require* a RAID controller or SAS HBA that is installed in the internal RAID adapter riser slot:

- Two 2.5-inch simple-swap SAS drives
- Two 2.5-inch hot-swap drives (installed in the front drive bays)

The supported RAID controller or SAS host bus adapter is installed in a dedicated RAID adapter slot, through a riser card, at the rear of the server that is adjacent to the internal drive bays. Installation of the adapter is shown in the following figure.

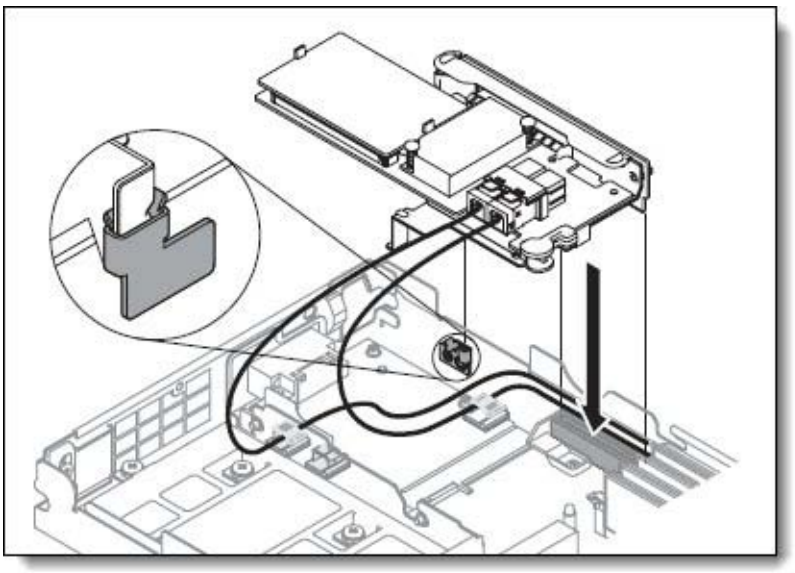

Figure 8. RAID controller and RAID riser card installation

The following table lists the RAID controllers and SAS HBA that are used for internal disk storage of the nx360 M5 server and the Riser card that is needed to install the adapter.

Table 10. Drive controllers for internal storage

Part number	Feature code	Description	Maximum supported
Riser card for RAID adapter			
00FL179	A5JZ	nx360 M5 RAID Riser	1
RAID Controllers and SAS Host Bus Adapters			
46C9110	A3YZ	ServeRAID M5210 SAS/SATA Controller for IBM System x	1*
46C9114	A45W	ServeRAID M1215 SAS/SATA Controller for IBM System x	1*
47C8675	A3YY	N2215 SAS/SATA HBA for IBM System x	1*
Features on Demand Upgrades - ServeRAID M5210			
47C8706	A3Z5	ServeRAID M5200 Series RAID 6 Upgrade-FoD	1
47C8708	A3Z6	ServeRAID M5200 Series Zero Cache/RAID 5 Upgrade-FoD	1
47C8710	A3Z7	ServeRAID M5200 Series Performance Accelerator-FoD	1
47C8712	A3Z8	ServeRAID M5200 Series SSD Caching Enabler-FoD	1
Features on Demand Upgrades - ServeRAID M1215			
00AE930	A5H5	ServeRAID M1200 Zero Cache/RAID 5 Upgrade FOD	1

* Mutually exclusive. Only one of these adapters is supported in the nx360 M5 and is installed in the internal RAID slot, and it requires RAID Riser, 00FL179.

The following table lists the adapters that are supported for each drive configuration.

Table 11. Drive type and RAID adapter support

Drive type	Quantity of drives supported	No RAID		Hardware RAID	
		On board SATA	N2215 HBA	ServeRAID M1215	ServeRAID M5210
1.8-inch SS SATA SSD	4	Yes	Yes	Yes	Yes
2.5-inch SS SATA HDD	2	Yes	Yes	Yes	Yes
2.5-inch SS SAS HDD	2	No	Yes	Yes	Yes
2.5-inch HS SATA or SAS HDD	2	No	Yes	Yes	Yes
3.5-inch SS SATA HDD	1	Yes	No	No	No

Controller specifications

The ServeRAID M5210 SAS/SATA Controller has the following specifications:

- Eight internal 12 Gbps SAS/SATA ports
- 12 Gbps throughput per port
- Based on the LSI SAS3108 12 Gbps ROC controller
- Two mini-SAS HD internal connectors (SFF8643)
- Supports connections to SAS/SATA drives and SAS Expanders
- Supports RAID levels 0, 1, and 10
- Supports RAID levels 5 and 50 with optional M5200 Series RAID 5 upgrades
- Supports RAID 6 and 60 with the optional M5200 Series RAID 6 Upgrade
- Supports 1 GB cache (no battery backup) or 1 GB or 2 GB flash-backed cache
- Supports performance upgrades through IBM Features on Demand

The ServeRAID M1215 SAS/SATA Controller has the following specifications:

- Eight internal 12 Gbps SAS/SATA ports
- Up to 12 Gbps throughput per port
- Two internal mini-SAS HD connectors (SFF8643)
- Based on the LSI SAS3008 12 Gbps RAID on Chip (ROC) controller
- Support for RAID levels 0, 1, and 10 standard; support for RAID 5 and 50 with optional FoD upgrade
- Zero Controller Cache, no battery/flash backup
- Optional support for self-encrypting drives (SEDs) with MegaRAID SafeStore (with RAID 5 upgrade)
- Fixed stripe size of 64 KB

For more information, see the list of IBM Redbooks® Product Guides in the RAID adapters category: http://www.redbooks.ibm.com/portals/systemx?Open&page=pg&cat=raid

Internal drive options

The following table lists hard disk drive options for the internal disk storage of the nx360 M5 server. Here are the rules for mixing drive types:

- The server supports multiple drive types: SATA HDDs (simple swap or hot-swap), SAS HDDs (simple swap or hot-swap), SAS SSDs, and SATA SSDs. These drive types can be intermixed in a server and on the same RAID controller, but they cannot be intermixed in the same RAID array. In other words, all drives in a single RAID array must be either all SAS HDDs or all SATA HDDs or all SATA SSDs or all SAS SSDs.

- Mixing hot-swap (front) and simple-swap (internal) HDDs: Only 2.5-inch simple-swap drives are supported in combination with 2.5-inch hot-swap drives. The 1.8-inch and 3.5-inch internal drives are not supported when 2.5-inch hot-swap drives are installed.

Table 12. Disk drive options for internal disk storage

Part number	Feature code	Description	Maximum supported
3.5-inch simple-swap SATA HDDs			
00AD010	A487	IBM 1TB 7.2K 6Gbps SATA 3.5" HDD for NeXtScale System	1
00AD020	A489	IBM 3TB 7.2K 6Gbps SATA 3.5" HDD for NeXtScale System	1
00AD025	A4GC	IBM 4TB 7.2K 6Gbps SATA 3.5" HDD for NeXtScale System	1
3.5-inch simple-swap SATA HDDs - 512e format			
00FN123	A5VV	IBM 2TB 7.2K 6Gbps NL SATA 3.5" 512e HDD for NextScale System	1
00FN138	A5VW	IBM 3TB 7.2K 6Gbps NL SATA 3.5" 512e HDD for NextScale System	1
00FN153	A5VX	IBM 4TB 7.2K 6Gbps NL SATA 3.5" 512e HDD for NextScale System	1
00FN168	A5VY	IBM 5TB 7.2K 6Gbps NL SATA 3.5" 512e HDD for NextScale System	1
00FN183	A5VZ	IBM 6TB 7.2K 6Gbps NL SATA 3.5" 512e HDD for NextScale System	1
2.5-inch simple-swap SAS HDDs			
00AD055	A48D	IBM 300GB 10K 6Gbps SAS 2.5" HDD for NeXtScale System	2
00AJ290	A5NG	IBM 600GB 15K 6Gbps SAS 2.5" HDD for NeXtScale System	2
00FN040	A5NC	IBM 1.2TB 10K 6Gbps SAS 2.5" HDD for NeXtScale System	2
2.5-inch hot-swap HDDs			
00AJ096	A4TL	IBM 300GB 10K 6Gbps SAS 2.5" G3HS HDD	2
00AJ136	A4TW	IBM 500GB 7.2K 6Gbps NL SATA 2.5" G3HS HDD	2
00AJ126	A4TS	IBM 600GB 15K 6Gbps SAS 2.5" G3HS HDD	2
00AJ146	A4TP	IBM 1.2TB 10K 6Gbps SAS 2.5" G3HS HDD	2
1.8-inch simple-swap Enterprise Value SSDs			
00AJ040	A4KV	S3500 80GB SATA 1.8" MLC Enterprise Value SSD for IBM System x	4
00AJ050	A4KX	S3500 400GB SATA 1.8" MLC Enterprise Value SSD for IBM System x	4

Internal tape drives

The server does not support internal tape drive options.

Optical drives

The server does not support internal optical drive options. Instead, use an external USB drive, such as the IBM and Lenovo part numbers 73P4515 or 73P4516.

I/O expansion options

The nx360 M5 offers the following I/O expansion options:

- One PCIe 3.0 x16 ML2 adapter slot (optional, front accessible)
- One PCIe 3.0 x16 full-height half-length slot (optional, front accessible)
- One PCIe 2.0 x8 slot for internal RAID controller (optional, not front accessible)

Notes:

- Each slot requires a riser card, as listed in the following table.
- The use of the PCIe full-height slot and the use of the two 2.5-inch hot-swap drive bays are mutually exclusive.
- When the PCIe Native Expansion Tray is installed, the full-height half-length slot becomes a PCIe 3.0 x8 interface (physically still a x16 connector).

The front accessible slots are shown in the following figure. The internal slot for the RAID controller is shown in Figure 3.

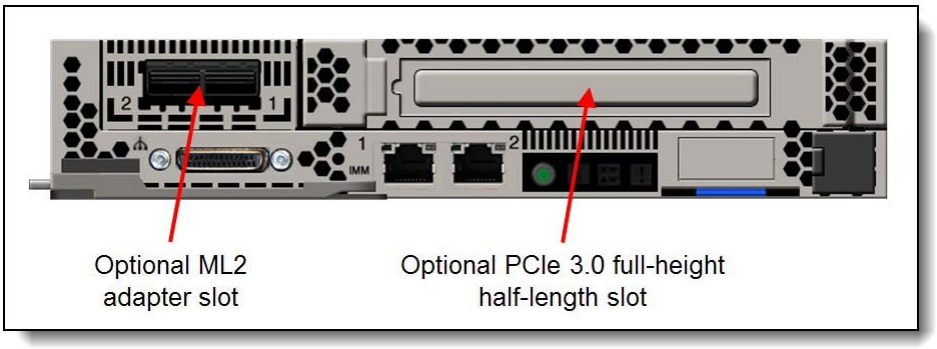

Figure 9. Optional front accessible PCIe slots

With the addition of the IBM NeXtScale PCIe Native Expansion Tray, the server has two additional PCIe 3.0 x16 full-height full-length double-width slots, as described in the "IBM NeXtScale PCIe Native Expansion Tray" section.

The ordering information for optional risers for the three slots is listed in the following table.

Table 13. Riser card options

Part number	Feature code	Description	Maximum supported
00FL180	A5JV	nx360 M5 ML2 Riser	1
00FL464	A5JY	nx360 M5 Compute Node Front Riser	1
00FL179	A5JZ	nx360 M5 RAID Riser	1

Network adapters

The nx360 M5 offers two Gigabit Ethernet ports with the following features:

- Broadcom BCM5717 Gigabit Ethernet controller
- TCP/IP Offload Engine (TOE) support
- Wake on LAN support
- Receive side Scaling (RSS) and Transmit side Scaling (TSS) support
- MSI and MSI-X capability (up to five MSI-X vectors)
- VLAN tag support (IEEE 802.1Q)
- Layer 2 priority encoding (IEEE 802.1p)
- Link aggregation (IEEE 802.3ad)
- Full-duplex flow control (IEEE 802.3x)
- IP, TCP, and UDP checksum offload (hardware based) on Tx/Rx over IPv4/IPv6
- Hardware TCP segmentation offload over IPv4/IPv6
- Jumbo frame support
- NIC Teaming (Load Balancing and Failover)
- One port that is shared with IMM2 by using the Network Controller-Sideband Interface (NC-SI)

The nx360 M5 server supports a Mezzanine LOM Generation 2 (ML2) adapter with a dedicated slot at the front of the server, as shown in the previous figure. The usage of an ML2 adapter also requires the installation of the ML2 Riser card. The Riser card and supported adapters are listed in the following table.

Table 14. Mezzanine LOM Gen 2 (ML2) Adapters

Part number	Feature code	Description
Riser card for ML2 adapters		
00FL180	A5JV	nx360 M5 ML2 Riser
ML2 Ethernet adapters		
00D2026	A40S	Broadcom NetXtreme II ML2 Dual Port 10GbaseT for IBM System x
00D2028	A40T	Broadcom NetXtreme II ML2 Dual Port 10GbE SFP+ for IBM System x
00D1996	A40Q	Emulex VFA5 ML2 Dual Port 10GbE SFP+ Adapter for IBM System x
00D1994	A40P	Intel X540 ML2 Dual Port 10GbaseT Adapter for IBM System x
00FP650	A5RK	Mellanox ConnectX-3 Pro ML2 2x40GbE/FDR VPI Adapter for IBM System x
ML2 InfiniBand adapters		
00FP650	A5RK	Mellanox ConnectX-3 Pro ML2 2x40GbE/FDR VPI Adapter for IBM System x
FCoE / iSCSI upgrades - IBM Features on Demand		
00D8544	A4NZ	Emulex VFA5 ML2 FCoE/iSCSI License for IBM System x (FoD) Features on Demand upgrade for 00D1996

The following table lists additional supported network adapters in the standard full-height half-length PCIe slot. The usage of an adapter in this slot also requires the installation of the PCIe Riser card.

Table 15. Network adapters

Part number	Feature code	Description
Riser card for PCIe adapters		
00FL464	A5JY	nx360 M5 Compute Node Front Riser
40 Gb Ethernet		
00D9550	A3PN	Mellanox ConnectX-3 40GbE / FDR IB VPI Adapter for IBM System x
10 Gb Ethernet		
44T1370	A5GZ	Broadcom NetXtreme 2x10GbE BaseT Adapter for IBM System x
00D9690	A3PM	Mellanox ConnectX-3 10 GbE Adapter for IBM System x
47C9977	A522	Solarflare SFN7122F 2x10GbE SFP+ Flareon Ultra for IBM System x
Gigabit Ethernet		
94Y5180	A4Z6	Broadcom NetXtreme Dual Port 10GbE SFP+ Adapter for IBM System x
90Y9370	A2V4	Broadcom NetXtreme I Dual Port GbE Adapter for IBM System x
90Y9352	A2V3	Broadcom NetXtreme I Quad Port GbE Adapter for IBM System x
InfiniBand		
00D9550	A3PN	Mellanox ConnectX-3 40GbE / FDR IB VPI Adapter for IBM System x

For more information, see the list of IBM Redbooks Product Guides in the Network adapters category: http://www.redbooks.ibm.com/portals/systemx?Open&page=pg&cat=networkadapters

Storage host bus adapters

The following table lists the storage HBAs that are supported by the nx360 M5 server. These are installed in the full-height PCIe slot and require the riser also to be installed.

Table 16. Storage adapters

Part number	Feature code	Description
Riser card for PCIe adapters		
00FL464	A5JY	nx360 M5 Compute Node Front Riser
Fibre Channel - 16 Gb		
81Y1668	A2XU	Brocade 16Gb FC Single-port HBA for IBM System x
81Y1675	A2XV	Brocade 16Gb FC Dual-port HBA for IBM System x
81Y1655	A2W5	Emulex 16Gb FC Single-port HBA for IBM System x
81Y1662	A2W6	Emulex 16Gb FC Dual-port HBA for IBM System x
00Y3337	A3KW	QLogic 16Gb FC Single-port HBA for IBM System x
00Y3341	A3KX	QLogic 16Gb FC Dual-port HBA for IBM System x
Fibre Channel - 8 Gb		
46M6049	3589	Brocade 8Gb FC Single-port HBA for IBM System x
46M6050	3591	Brocade 8Gb FC Dual-port HBA for IBM System x
42D0485	3580	Emulex 8Gb FC Single-port HBA for IBM System x
42D0494	3581	Emulex 8Gb FC Dual-port HBA for IBM System x
42D0501	3578	QLogic 8Gb FC Single-port HBA for IBM System x
42D0510	3579	QLogic 8Gb FC Dual-port HBA for IBM System x

For more information, see the list of IBM Redbooks Product Guides in the Host Bus Adapters category: http://www.redbooks.ibm.com/portals/systemx?Open&page=pg&cat=hba

PCIe SSD adapters

The server does not support High IOPS SSD adapters.

IBM NeXtScale PCIe Native Expansion Tray

The IBM NeXtScale PCIe Native Expansion Tray is a half-wide 1U expansion tray that attaches to the nx360 M5 to provide two full-height full-length double-width PCIe 3.0 x16 slots. The tray is designed to support two GPU adapters or coprocessors.

Note: The PCIe Native Expansion Tray and the Storage Native Expansion Tray cannot be connected to the same compute node.

The following figure shows the PCIe Native Expansion Tray attached to an nx360 M5 (shown with the top cover removed). The figure shows two NVIDIA GPUs installed.

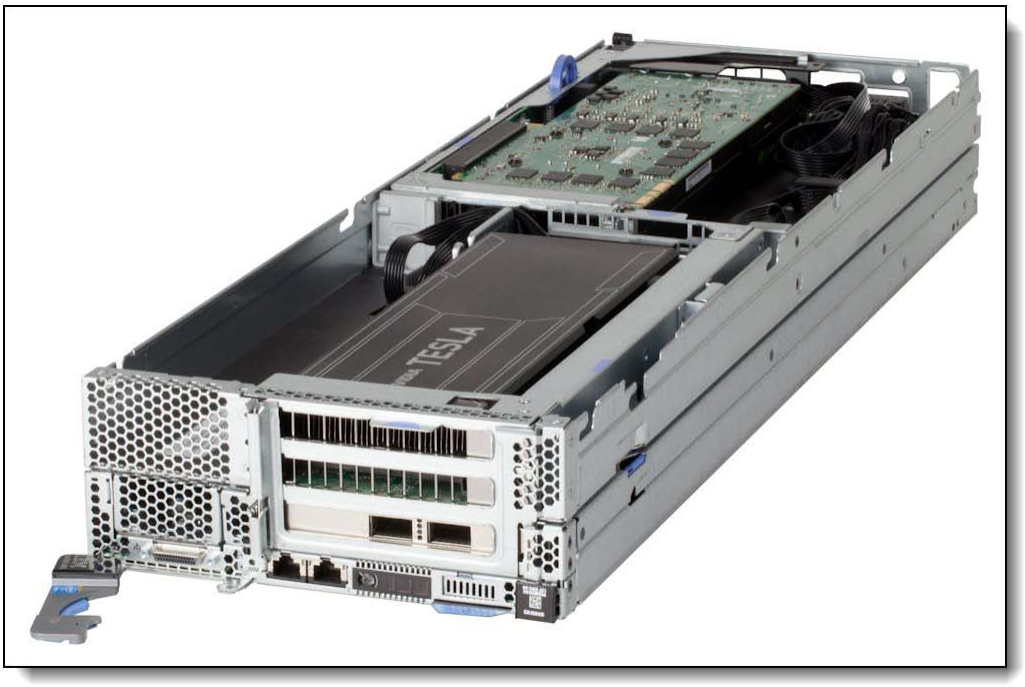

Figure 10. IBM NeXtScale PCIe Native Expansion Tray attached to an nx360 M5 compute node

Ordering information is listed in the following table.

Table 17. Ordering information

Part number	Feature code	Description
00Y8393	A4MB	IBM NeXtScale PCIe Native Expansion Tray

When the PCIe Native Expansion Tray is used, it is connected to the compute node through two riser cards, each providing a PCIe x16 connector to the GPUs or coprocessors that are installed in the tray.

- A 2-slot PCIe 3.0 x24 riser card is installed in the front riser slot (riser slot 1; see Figure 3). This riser card replaces the standard 1-slot riser that is used to connect standard PCIe cards that are internal to the compute node. The 2-slot riser card offers these connections:
  - PCIe 3.0 x8 slot for the slot internal to the compute node
  - PCIe 3.0 x16 slots for the front adapter in the PCIe Native Expansion Tray
- A 1-slot PCIe 3.0 x16 riser card is installed in the rear riser slot (riser slot 2; see Figure 3). This riser is used to connect the rear adapter in the PCIe Native Expansion Tray.

Only GPUs and coprocessors are supported in the PCIe Native Expansion Tray and only those that are listed in the following section. The PCIe Native Expansion Tray also includes the auxiliary power connectors and cables for each adapter slot that is necessary for each supported GPU and coprocessor.

GPU and coprocessor adapters

The nx360 M5 supports GPU adapters and coprocessors when the IBM NeXtScale PCIe Native Expansion Tray is attached, as described in the "IBM NeXtScale PCIe Native Expansion Tray" section. The following table lists the supported adapters.

The operating systems that are supported by each GPU and coprocessor adapter is listed in the "Supported operating systems" section.

Here are the configuration rules:

- The usage of GPUs or coprocessors require the usage of the IBM NeXtScale PCIe Native Expansion Tray.
- One or two GPUs or coprocessors can be installed.
- If two GPU adapters or coprocessors are installed, they must be identical.
- 1300 W power supplies are required in the chassis.
- 200 - 240 V AC utility power is required. 100 - 127 V AC is not supported.

Table 18. GPU adapters and coprocessors

Part number	Feature code	Description	Power consumption	Maximum supported
00J6162	A3GP	Intel Xeon Phi 7120P	300 W	2
00J6160	A3GM	NVIDIA GRID K1	130W	2
00J6161	A3GN	NVIDIA GRID K2	225 W	2
00FL133	A564	NVIDIA Tesla K40	235 W	2

Power supplies

The IBM NeXtScale n1200 enclosure supports up to six redundant hot-plug power supplies, providing N+N or N+1 redundancy. Power policies with no redundancy also are supported. These High Efficiency (HE) Platinum AC power supplies are 80 PLUS Platinum certified to allow for the best efficiency values of your data center. The following table lists the supported power supply options.

Table 19. Power supplies

Part number	Feature code	Description	Min / Max supported	Chassis model where used
00Y8569	A41T	CFF 900W Power Supply	6 / 6	A2x
00Y8652	A4MM	CFF 1300W Power Supply	2 / 6	A3x, A4x

The power supply options have the following features:

- Supports N+N or N+1 Power Redundancy, or Non-redundant power configurations to support higher density
- Power management controller and configured through the Fan and Power Controller
- Integrated 2500 RPM fan
- 80 PLUS Platinum certified
- Built-in overload and surge protection

900 W power supply specifications:

- Supports dual-range voltage: 100 - 240 V
- 100 - 127 (nominal) V AC; 50 or 60 Hz; 6.8 A (maximum)
- 200 - 240 (nominal) V AC; 50 or 60 Hz; 5.0 A (maximum)

1300 W power supply specifications:

- Supports high-range voltage only: 200 - 240 V
- 200 - 240 (nominal) V AC; 50 or 60 Hz; 6.9 A (maximum)

Integrated virtualization

The server supports VMware vSphere (ESXi), which is installed on a USB memory key. The key is installed in a USB socket inside the server. The following table lists the virtualization options.

Customized VMware vSphere images can be downloaded from the following website:
http://ibm.com/systems/x/os/vmware/

Table 20. Virtualization options

Part number	Feature code	Description	Maximum supported
41Y8298	A2G0	IBM Blank USB Memory Key for VMware ESXi Downloads	1
41Y8385	A584	IBM USB Memory Key for VMware ESXi 5.5 Update 2	1

Local server management

The nx360 M5 provides local console access through the KVM connector at the front of the server. A console breakout cable is used with this connector, which provides a VGA port, two USB ports, and a DB9 serial port. The cable is shown in the following figure.

Figure 11. Console breakout cable

One console breakout cable is shipped with the NeXtScale n1200 enclosure. Additional cables can be ordered per the following table.

Table 21. Console breakout cable

Part number	Feature code	Description	Maximum supported
00Y8366	A4AK	Console breakout cable (KVM Dongle cable)	1

Tip: This is the same cable that is used with IBM Flex System, but has a different part number because of the included materials.

To aid with problem determination, the server includes light path diagnostics, which is a set of LEDs on the front of the server and inside the server that show you which component is failing. The LEDs are shown in the following figure.

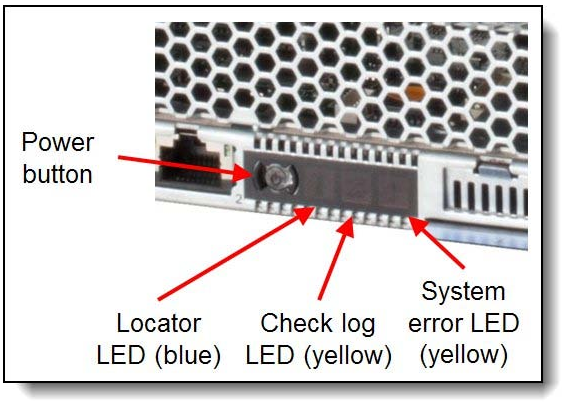

Figure 12. Power button and system LEDs

When an error occurs, the system error LED lights up. Review the logs through the web interface of the IMMv2 (see the "Remote server management" section). If needed, power off the server and remove it

from the enclosure. Then, press and hold the power button to activate the system board LEDs. The LED next to the failed component lights up.

Remote server management

The server contains IBM Integrated Management Module II (IMM2), which provides advanced service-processor control, monitoring, and an alerting function. If an environmental condition exceeds a threshold or if a system component fails, the IMM2 lights LEDs to help you diagnose the problem, records the error in the event log, and alerts you about the problem. The server includes IMM2 Basic and can be upgraded to IMM2 Standard and IMM2 Advanced with Feature on Demand (FoD) licenses.

IMM2 Basic has the following features:

- Industry-standard interfaces and protocols
- Intelligent Platform Management Interface (IPMI) Version 2.0
- Common Information Model (CIM)
- Advanced Predictive Failure Analysis (PFA) support
- Continuous health monitoring
- Shared Ethernet connection
- Domain Name System (DNS) server support
- Dynamic Host Configuration Protocol (DHCP) support
- Embedded Dynamic System Analysis (DSA)
- LAN over USB for in-band communications to the IMM
- Serial over LAN
- Remote power control
- Server console serial redirection

IMM2 Standard (as enabled by using the Feature on Demand software license key using part number 90Y3900) has the following features in addition to the IMM2 Basic features:

- Remote access through a secure web console
- Access to server vital product data (VPD)
- Automatic notification and alerts
- Continuous health monitoring and control
- Email alerts
- Syslog logging support
- Enhanced user authority levels
- Event logs that are time stamped, saved on the IMM, and that can be attached to email alerts
- OS watchdogs
- Remote configuration through Advanced Settings Utility (ASU)
- Remote firmware updating
- User authentication using a secure connection to a Lightweight Directory Access Protocol (LDAP) server

IMM2 Advanced (as enabled by using the Feature on Demand software license key using part number 90Y3901) adds the following features on top of those of IMM Standard:

- Remotely viewing video with graphics resolutions up to 1600x1200 at 75 Hz with up to 23 bits per pixel color depths, regardless of the system state
- Remotely accessing the server by using the keyboard and mouse from a remote client
- Mapping the CD or DVD drive, diskette drive, and USB flash drive on a remote client, and mapping ISO and diskette image files as virtual drives that are available for use by the server
- Uploading a diskette image to the IMM memory and mapping it to the server as a virtual drive

The blue-screen capture feature captures the video display contents before the IMM restarts the server when the IMM detects an operating system hang condition. A system administrator can use the blue-screen capture to assist in determining the cause of the hang condition.

The following table lists the remote management options.

Note: The IMM2 Advanced upgrade requires the IMM2 Standard upgrade.

Table 22. Remote management options

Part number	Feature codes	Description	Maximum supported
90Y3900	A1MK	IBM Integrated Management Module Standard Upgrade	1
90Y3901	A1ML	IBM Integrated Management Module Advanced Upgrade (requires Standard Upgrade, 90Y3900)	1

The nx360 M5 provides two Ethernet ports standard, one of which (port 1) is configured in UEFI by default to be shared between the operating system and the IMM2. In shared mode, this port enables you to connect remotely to the IMM2 to perform systems management functions. A third Ethernet port is optional and provides a dedicated 10/100 Mbps Ethernet connection to the IMM2.

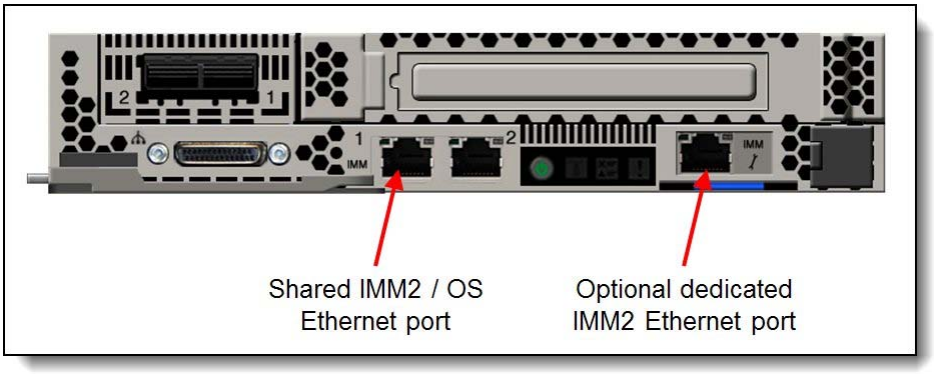

Figure 13. IMM ports

The following table lists the ordering information for the dedicated IMM2 port option.

Table 23. Dedicated IMM2 Ethernet port option

Part number	Feature codes	Description	Maximum supported
00FL177	A5JX	nx360 M5 IMM Management Interposer	1

Remote enclosure management

The IBM NeXtScale n1200 Enclosure offers a remote management capability through the Fan and Power Controller, which is at the back of the enclosure, as shown in the following figure.

Figure 14. Fan and Power Controller

The Fan and Power Controller has one external RJ45 port, which provides a 10/100 Mbps Ethernet connection for browser-based remote control.

The port provides the following interfaces:

- An HTTP (web browser) interface for remote management
- An IPMI interface to the IMM in each server
- An IPMI interface to higher managers, such as xCAT

The module provides the following functions:

- Power supply redundancy and over-subscription configuration
- Power capping/saving configuration
- Power restore policy
- Acoustic mode setting
- Configuration/log export to USB (a USB port is provided inside the module)
- IMM remote reset or Server remote reseat (AC cycle)
- Status monitor: Power consumption, node status, power supply status, and fan status
- Network configuration

The FPC also includes a USB key that is housed inside the unit. The USB key stores the event log for the FPC plus power, cooling, and network configuration data.

Supported operating systems

The server supports the following operating systems:

- Microsoft Windows Server 2012 R2
- Microsoft Windows Server 2012
- SUSE Linux Enterprise Server 11 for AMD64/EM64T, SP3
- SUSE Linux Enterprise Server 11 with Xen for AMD64/EM64T, SP3
- Red Hat Enterprise Linux 6 Server x64 Edition, U5
- Red Hat Enterprise Linux 7
- SUSE Enterprise Linux Server (SLES) 12
- SUSE Linux Enterprise Server 12 with XEN
- VMware vSphere 5.5 (ESXi), U2
- VMware vSphere 5.1 (ESXi), U2

For the latest information about the specific versions and service levels that are supported and any other prerequisites, see the IBM ServerProven® website:
http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/nos/matrix.shtml

The following table lists the operating system support for GPUs and coprocessors.

Table 24. Operating system support for GPU and coprocessor adapters

Operating system	NVIDIA Tesla K40m	NVIDIA Grid K1	NVIDIA Grid K2	Intel Xeon Phi 7120P
Microsoft Windows Server 2012	Y	Y	Y	Y
Microsoft Windows Server 2012 R2	Y	Y	Y	Y
SUSE Linux Enterprise Server 11 for AMD64/EM64T (SP3)	Y	N	N	Y
Red Hat Enterprise Linux 6 Server x64 Edition (U5)	Y	N	N	Y
Red Hat Enterprise Linux 7	Y	N	N	Y
VMware vSphere (ESXi) 5.1	N	Y	Y	N
VMware vSphere (ESXi) 5.5	N	Y	Y	N

Physical and electrical specifications

Here are the NeXtScale nx360 M5 dimensions:

- Width: 216 mm (8.5 in.)
- Height: 41 mm (1.6 in.)
- Depth: 659 mm (25.9 in.)
- Maximum weight: 6.17 kg (13.6 lb)

Here are the NeXtScale n1200 enclosure dimensions:

- Width: 447 mm (17.6 in.)
- Height: 263 mm (10.4 in.)
- Depth: 915 mm (36 in.)
- Fully configured (stand-alone): 112 kg (247 lb), empty chassis 28 kg (62 lb)

Supported environment

The NeXtScale nx360 M5 compute node complies with ASHRAE class A3 specifications. The supported environment when powered on is as follows:

- Temperature: 5°C - 40°C (41°F - 104°F) up to 950 m (3,117 ft)
- Above 950m, de-rated maximum air temperature 1C / 175m
- Humidity, non-condensing: -12°C dew point (10.4°F) and 8% - 85% relative humidity
- Maximum dew point: 24°C (75°F)
- Maximum altitude: 3050 m (10,000 ft) and 5°C - 28°C (41°F - 82°F)

The minimum humidity level for class A3 is the higher (more moisture) of the -12°C dew point and the 8% relative humidity. These intersect at approximately 25°C. Below this intersection (~25°C), the dew point (-12°C) represents the minimum moisture level, while above it relative humidity (8%) is the minimum.

Moisture levels lower than 0.5°C DP, but not lower -10 °C DP or 8% relative humidity, can be accepted if appropriate control measures are implemented to limit the generation of static electricity on personnel and equipment in the data center. All personnel and mobile furnishings and equipment must be connected to ground through an appropriate static control system. The following items are considered the minimum requirements:

- Conductive materials (conductive flooring, conductive footwear on all personnel that go into the data center, and all mobile furnishings and equipment will be made of conductive or static dissipative materials).
- During maintenance on any hardware, a properly functioning wrist strap must be used by any personnel who come into contact with IT equipment.

If you adhere to ASHRAE Class A3, Temperature: 36°C - 40°C (96.8°F - 104°F) with relaxed support:

- A support cloud like workload with no performance degradation is acceptable (Turbo-Off).
- Under no circumstance can any combination of worst case workload and configuration result in system shutdown or design exposure at 40°C.
- The worst case workload (like Linpack and Turbo-On) might have performance degradation.

Specific component restrictions:

- Processor E5-2699 v3, E5-2697 v3, E5-2667 v3, E5-2643 v3, E5-2637 v3: Temperature: 5°C - 30°C (41°F - 86°F); Altitude: 0 – 304.8 m (1000ft).
- Intel Xeon Phi 7120P: Temperature: 5°C - 30°C (41°F - 86°F); Altitude: 0 – 304.8 m (1000ft).

- nx360 M5 with rear HDD: Temperature: 5°C - 30°C (41°F - 86°F); Altitude: 0 – 304.8 m (1000ft).
- nx360 M5 servers in configuration that also includes nx360 M4 servers are not supported by any of the following processors: E5-2699 v3, E5-2697 v3, E5-2667 v3, E5-2643 v3, E5-2637 v3.

Electrical requirements

- 100 - 127 (nominal) V AC; 50 Hz or 60 Hz; 6.8 A
- 200 - 240 (nominal) V AC; 50 Hz or 60 Hz; 5.0 A
- Input kilovolt-amperes (kVA) (approximately):
  - Minimum configuration: 0.1 kVA
  - Maximum configuration: 6.0 kVA

BTU output

- Minimum configuration: 341 Btu/hr (100 watts)
- Maximum configuration: 20,471 Btu/hr (6,000 watts)

Noise level

- 7.0 bels (idle)

Regulatory compliance

The server conforms to the following international standards:

- Energy Star 2.0
- FCC - Verified to comply with Part 15 of the FCC Rules, Class A
- Canada ICES-003, issue 5, Class A
- UL/IEC 60950-1
- CSA C22.2 No. 60950-1
- NOM-019
- Argentina IEC60950-1
- Japan VCCI, Class A
- IEC 60950-1 (CB Certificate and CB Test Report)
- China CCC GB4943.1, GB9254, Class A, and GB17625.1
- Taiwan BSMI CNS13438, Class A; CNS14336-1
- Australia/New Zealand AS/NZS CISPR 22, Class A; AS/NZS 60950.1
- Korea KN22, Class A, KN24
- Russia/GOST ME01, IEC-60950-1, GOST R 51318.22, and GOST R 51318.24,
- GOST R 51317.3.2, GOST R 51317.3.3
- IEC 60950-1 (CB Certificate and CB Test Report)
- CE Mark (EN55022 Class A, EN60950-1, EN55024, and EN61000-3-2,
- EN61000-3-3)
- CISPR 22, Class A
- TUV-GS (EN60950-1/IEC 60950-1, and EK1-ITB2000)

Warranty options

The IBM NeXtScale nx360 M5 and IBM NeXtScale n1200 enclosure have a 3-year onsite warranty with 9x5/next business day terms. IBM offers the warranty service upgrades through IBM ServicePac offerings. The IBM ServicePac is a series of prepackaged warranty maintenance upgrades and post-warranty maintenance agreements with a well-defined scope of services, including service hours, response time, term of service, and service agreement terms and conditions.

IBM ServicePac offerings are country-specific. Each country might have its own service types, service levels, response times, and terms and conditions. Not all covered types of ServicePac offerings might be available in a particular country. For more information about IBM ServicePac offerings that are available in your country, visit the IBM ServicePac Product Selector:

https://www-304.ibm.com/sales/gss/download/spst/servicepac

The following table explains warranty service definitions in more detail.

Table 25. Warranty service definitions

Term	Description
IBM onsite repair (IOR)	A service technician comes to the server's location for equipment repair.
24x7x2 hour	A service technician is scheduled to arrive at your customer’s location within two hours after remote problem determination is completed. We provide service around the clock, every day, including IBM holidays.
24x7x4 hour	A service technician is scheduled to arrive at your customer’s location within four hours after remote problem determination is completed. We provide service around the clock, every day, including IBM holidays.
9x5x4 hour	A service technician is scheduled to arrive at your customer’s location within four business hours after remote problem determination is completed. We provide service from 8:00 a.m. - 5:00 p.m. in the customer's local time zone, Monday through Friday, excluding IBM holidays. If after 1:00 p.m. it is determined that onsite service is required, the customer can expect the service technician to arrive the morning of the following business day. For noncritical service requests, a service technician arrives by the end of the following business day.
9x5 next business day	A service technician is scheduled to arrive at your customer’s location on the business day after we receive your call, following remote problem determination. We provide service from 8:00 a.m. - 5:00 p.m. in the customer's local time zone, Monday through Friday, excluding IBM holidays.

In general, these are the types of IBM ServicePac offerings:

- Warranty and maintenance service upgrades
  - One, 2, 3, 4, or 5 years of 9x5 or 24x7 service coverage
  - Onsite repair from next business day to 4 or 2 hours
  - One or 2 years of warranty extension
- Remote technical support services
  - One or three years with 24x7 coverage (severity 1) or 9x5/next business day for all severities
  - Installation and start support for System x servers
  - Remote technical support for System x servers
  - Software support - Support Line
    - Microsoft or Linux software
    - VMware

Rack cabinets

The NeXtScale n1200 enclosure is supported in the following racks:

- IBM 42U 1100 mm Enterprise V2 Deep Dynamic Rack
- IBM 42U 1100 mm Dynamic Enterprise V2 Expansion Rack

For more information, see the list of IBM Redbooks Product Guides in the Rack cabinets and options category:
http://www.redbooks.ibm.com/portals/systemx?Open&page=pg&cat=rack

Rack options

The server supports the rack console switches and monitor kits that are listed in the following table.

Table 26. Rack options

Part number	Feature code	Description
Monitor kits and keyboard trays		
17238BX	1723HC1 FC A3EK	IBM 1U 18.5" Standard Console
17238EX	1723HC1 FC A3EL	IBM 1U 18.5" Enhanced Media Console
172317X	1723HC1 FC 0051	1U 17in Flat Panel Console Kit
172319X	1723HC1 FC 0052	1U 19in Flat Panel Console Kit
Console switches		
3858D3X	3858HC1 FC A4X1	Avocent Universal Management Gateway 6000 for IBM
1754D2X	1754HC2 FC 6695	IBM Global 4x2x32 Console Manager (GCM32)
1754D1X	1754HC1 FC 6694	IBM Global 2x2x16 Console Manager (GCM16)
1754A2X	1754HC4 FC 0726	IBM Local 2x16 Console Manager (LCM16)
1754A1X	1754HC3 FC 0725	IBM Local 1x8 Console Manager (LCM8)
Console cables		
00AK142	A4X4	UM KVM Module VGA+SD Dual RJ45
43V6147	3757	IBM Single Cable USB Conversion Option (UCO)
39M2895	3756	IBM USB Conversion Option (4 Pack UCO)
39M2897	3754	IBM Long KVM Conversion Option (4 Pack Long KCO)
46M5383	5341	IBM Virtual Media Conversion Option Gen2 (VCO2)
46M5382	5340	IBM Serial Conversion Option (SCO)

For more information, see the list of IBM Redbooks Product Guides in the Rack cabinets and options category:
http://www.redbooks.ibm.com/portals/systemx?Open&page=pg&cat=rack

External disk storage systems

The following table lists the external storage systems that are supported by the server and can be ordered through the System x sales channel. The server might support other IBM disk systems that are not listed in this table. For more information, see IBM System Storage® Interoperability Center at http://www.ibm.com/systems/support/storage/ssic.

Table 27. External disk storage systems

Part number	Description
1746A2D	IBM System Storage DS3512 Express Dual Controller Storage System
1746A2S	IBM System Storage DS3512 Express Single Controller Storage System
1746A4D	IBM System Storage DS3524 Express Dual Controller Storage System
1746A4S	IBM System Storage DS3524 Express Single Controller Storage System
181494H	IBM System Storage DS3950 Model 94
181498H	IBM System Storage DS3950 Model 98
181492H	IBM System Storage EXP395 Expansion Unit
1746A2E	IBM System Storage EXP3512 Express Storage™ Expansion Unit
1746A4E	IBM System Storage EXP3524 Express Storage Expansion Unit

For more information, see the list of IBM Redbooks Product Guides in the Storage Systems category: http://www.redbooks.ibm.com/portals/systemx?Open&page=pg&cat=externalstorage

External backup units

The server supports the external backup attachment options that are listed in the following table.

Table 28. External backup options (Part 1)

Part number	Description
External tape expansion enclosures for internal tape drives	
87651UX	1U Tape Drive Enclosure
8767HHX	Half High Tape Drive Enclosure
87651NX	1U Tape Drive Enclosure (with Nema 5-15P LineCord)
8767HNX	Half High Tape Drive Enclosure (with Nema 5-15P LineCord)
Tape enclosure adapters (with cables)	
44E8869	USB Enclosure Adapter Kit
40K2599	SAS Enclosure Adapter Kit
Internal backup drives that are supported by external tape enclosures	
46C5364	IBM RDX Removable Hard Disk Storage System - Internal USB 160 GB Bundle
46C5387	IBM RDX Removable Hard Disk Storage System - Internal USB 320 GB Bundle
46C5388	IBM RDX Removable Hard Disk Storage System - Internal USB 500 GB Bundle
46C5399	IBM DDS Generation 5 USB Tape Drive
39M5636	IBM DDS Generation 6 USB Tape Drive
43W8478	IBM Half High LTO Gen 3 SAS Tape Drive
44E8895	IBM Half High LTO Gen 4 SAS Tape Drive
49Y9898	IBM Half High LTO Gen 5 Internal SAS Tape Drive
00D8924	IBM Half High LTO Ultrium Gen 6 Internal SAS Tape Drive

Table 28. External backup options (Part 2)

Part number	Description
External backup units*	
362516X	IBM RDX Removable Hard Disk Storage System - External USB 160 GB Bundle
362532X	IBM RDX Removable Hard Disk Storage System - External USB 320 GB Bundle
362550X	IBM RDX Removable Hard Disk Storage System - External USB 500 GB Bundle
3628L3X	IBM Half High LTO Gen 3 External SAS Tape Drive (with US power cord)
3628L4X	IBM Half High LTO Gen 4 External SAS Tape Drive (with US power cord)
3628L5X	IBM Half High LTO Gen 5 External SAS Tape Drive (with US power cord)
3628N3X	IBM Half High LTO Gen 3 External SAS Tape Drive (without power cord)
3628N4X	IBM Half High LTO Gen 4 External SAS Tape Drive (without power cord)
3628N5X	IBM Half High LTO Gen 5 External SAS Tape Drive (without power cord)
3580S3V	System Storage TS2230 Tape Drive Express Model H3V
3580S4V	System Storage TS2240 Tape Drive Express Model H4V
3580S5E	System Storage TS2250 Tape Drive Express Model H5S
3580S5X	System Storage TS2350 Tape Drive Express Model S53
3572S4R	TS2900 Tape Library with LTO4 HH SAS drive & rack mount kit
3572S5R	TS2900 Tape Library with LTO5 HH SAS drive & rack mount kit
35732UL	TS3100 Tape Library Model L2U Driveless
35734UL	TS3200 Tape Library Model L4U Driveless
46X2682†	LTO Ultrium 5 Fibre Channel Drive
46X2683†	LTO Ultrium 5 SAS Drive Sled
46X2684†	LTO Ultrium 5 Half HigH Fibre Drive Sled
46X2685†	LTO Ultrium 5 Half High SAS Drive Sled
46X6912†	LTO Ultrium 4 Half High Fibre Channel Drive Sled
46X7117†	LTO Ultrium 4 Half High SAS DriveV2 Sled
46X7122†	LTO Ultrium 3 Half High SAS DriveV2 Sled

* Note: The external tape drives that are listed can be ordered through the System x sales channel. The server might support other IBM tape drives that are not listed in this table. For more information, see IBM System Storage Interoperability Center.
† Note: These part numbers are the tape drives options for 35732UL and 35734UL.

For more information, see the list of IBM Redbooks Product Guides in the Backup units category: http://www.redbooks.ibm.com/portals/systemx?Open&page=pg&cat=tape

Top-of-rack Ethernet switches

The server supports the top-of-rack Ethernet switches from IBM System Networking that are listed in the following table.

Table 29. IBM System Networking - Top-of-rack switches

Part number	Description
IBM System Networking - 1 Gb top-of-rack switches	
7309BAX	IBM System Networking RackSwitch™ G7028 (24 ports)
7309CAX	IBM System Networking RackSwitch G7028 (48 ports)
0446013	IBM System Networking RackSwitch G8000R
7309CFC	IBM System Networking RackSwitch G8000F
7309G52	IBM System Networking RackSwitch G8052R
730952F	IBM System Networking RackSwitch G8052F
IBM System Networking - 10 Gb top-of-rack switches	
7309DRX	IBM System Networking RackSwitch G8264CS (Rear to Front)
7309DFX	IBM System Networking RackSwitch G8264CS (Front to Rear)
7309BR6	IBM System Networking RackSwitch G8124ER
7309BF7	IBM System Networking RackSwitch G8124EF
7309G64	IBM System Networking RackSwitch G8264R
730964F	IBM System Networking RackSwitch G8264F
7309CR9	IBM System Networking RackSwitch G8264TR
7309CF9	IBM System Networking RackSwitch G8264TF
IBM System Networking - 40 Gb top-of-rack switches	
8036BRX	IBM System Networking RackSwitch G8332 (Rear to Front)
8036BFX	IBM System Networking RackSwitch G8332 (Front to Rear)
8036ARX	IBM System Networking RackSwitch G8316R
8036AFX	IBM System Networking RackSwitch G8316F

For more information, see the list of IBM Redbooks Product Guides in the Top-of-rack switches category: http://www.redbooks.ibm.com/portals/systemx?Open&page=pg&cat=tor

Additional edge switches are offered as part of the IBM Intelligent Cluster™ program, as listed in the following table.

Table 30. Switches in the IBM Intelligent Cluster program

Feature code	Description
1 Gb top-of-rack switches	
2733	Cisco 2960G-48TC-L (48 port, Layer 2)
Not available	Juniper EX4200 (48 port, Layer 2/3)
6941	SMC 8126L2 (26 port, Layer 2)
6673	SMC 8150L2 (50 port, Layer 2)
10 Gb top-of-rack switches	
A1M6	Cisco 3750X-48T-L (48 port, Layer 2/3)

Uninterruptible power supply units

The server supports attachments to the uninterruptible power supply (UPS) units that are listed in the following table.

Table 31. Uninterruptible power supply units

Part number	Description
Rack-mounted UPS	
21304RX	IBM UPS 10000XHV
53951AX	IBM 1500VA LCD 2U Rack UPS (100V/120V)
53951KX	IBM 1500VA LCD 2U Rack UPS (230V)
53952AX	IBM 2200VA LCD 2U Rack UPS (100V/120V)
53952KX	IBM 2200VA LCD 2U Rack UPS (230V)
53953AX	IBM 3000VA LCD 3U Rack UPS (100 V/120 V)
53953JX	IBM 3000VA LCD 3U Rack UPS (200 V/208 V)
53956AX	IBM 6000VA LCD 4U Rack UPS (200 V/208 V)
53956KX	IBM 6000VA LCD 4U Rack UPS (230 V)
53959KX	IBM 11000VA LCD 5U Rack UPS (200V/208V/230V)

For more information, see the list of IBM Redbooks Product Guides in the Power infrastructure category: http://www.redbooks.ibm.com/portals/systemx?Open&page=pg&cat=power

Power distribution units

The server supports attachments to the power distribution units (PDUs) that are listed in the following table.

Table 32. Power distribution units (part 1)

Part number	Description
Switched and Monitored PDUs	
46M4002	IBM 1U 9 C19/3 C13 Active Energy Manager DPI® PDU
46M4003	IBM 1U 9 C19/3 C13 Active Energy Manager 60A 3 Phase PDU
46M4004	IBM 1U 12 C13 Active Energy Manager DPI PDU
46M4005	IBM 1U 12 C13 Active Energy Manager 60A 3 Phase PDU
46M4167	IBM 1U 9 C19/3 C13 Switched and Monitored 30A 3 Phase PDU
Enterprise PDUs	
71762MX	IBM Ultra Density Enterprise PDU C19 PDU+ (WW)
71762NX	IBM Ultra Density Enterprise PDU C19 PDU (WW)
71763MU	IBM Ultra Density Enterprise PDU C19 3 Phase 60A PDU+ (NA)
71763NU	IBM Ultra Density Enterprise PDU C19 3 Phase 60A PDU (NA)
39M2816	IBM DPI C13 Enterprise PDU without power cord
39Y8923	DPI 60A Three Phase C19 Enterprise PDU with IEC309 3P+G (208 V) fixed power cord
39Y8941	DPI Single Phase C13 Enterprise PDU without power cord
39Y8948	DPI Single Phase C19 Enterprise PDU without power cord
Front-end PDUs	
39Y8934	DPI 32 amp/250 V Front-end PDU with IEC 309 2P+Gnd connector
39Y8935	DPI 63amp/250 V Front-end PDU with IEC 309 2P+Gnd connector
39Y8938	30 amp/125 V Front-end PDU with NEMA L5-30P connector
39Y8939	30 amp/250 V Front-end PDU with NEMA L6-30P connector
39Y8940	60 amp/250 V Front-end PDU with IEC 309 60A 2P+N+Gnd connector

Table 32. Power distribution units (part 2)

Part number	Description
Universal PDUs	
39Y8951	DPI Universal Rack PDU with US LV and HV power cords
39Y8952	DPI Universal Rack PDU with CEE7-VII Europe LC
39Y8953	DPI Universal Rack PDU with Denmark LC
39Y8954	DPI Universal Rack PDU with Israel LC
39Y8955	DPI Universal Rack PDU with Italy LC
39Y8956	DPI Universal Rack PDU with South Africa LC
39Y8957	DPI Universal Rack PDU with UK LC
39Y8958	DPI Universal Rack PDU with AS/NZ LC
39Y8959	DPI Universal Rack PDU with China LC
39Y8962	DPI Universal Rack PDU (Argentina)
39Y8960	DPI Universal Rack PDU (Brazil)
39Y8961	DPI Universal Rack PDU (India)
0U Basic PDUs	
46M4122	IBM 0U 24 C13 16A 3 Phase PDU
46M4125	IBM 0U 24 C13 30A 3 Phase PDU
46M4128	IBM 0U 24 C13 30A PDU
46M4131	IBM 0U 24 C13 32A PDU
46M4140	IBM 0U 12 C19/12 C13 60A 3 Phase PDU
46M4143	IBM 0U 12 C19/12 C13 32A 3 Phase PDU

For more information, see the list of IBM Redbooks Product Guides in the Power infrastructure category: http://www.redbooks.ibm.com/portals/systemx?Open&page=pg&cat=power

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Related publications and links

For more information, see these resources:

- IBM US Announcement Letter
  http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS114-142
- IBM NeXtScale System home page
  http://www.ibm.com/systems/x/hardware/highdensity/nextscale
- *IBM NeXtScale nx360 M5 Installation and Service Guide*
  http://ibm.com/support/
- *IBM NeXtScale n1200 Enclosure Installation and Service Guide*
  http://ibm.com/support/entry/portal/docdisplay?lndocid=migr-5093698
- ServerProven hardware compatibility page for the nx360 M5
  http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/xseries/5465.html
- IBM Redbooks Product Guides for IBM System x servers and options
  http://www.redbooks.ibm.com/portals/systemx?Open&page=pgbycat
- IBM Power Configurator
  http://ibm.com/systems/bladecenter/resources/powerconfig.html :
- Configuration and Option Guide
  http://www.ibm.com/systems/xbc/cog/
- xREF - IBM x86 Server Reference
  http://www.redbooks.ibm.com/xref
- IBM System x Support Portal
  http://ibm.com/support/entry/portal/

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